
AMES RESEARCH

Introduction

Throughout Ames history, four themes prevail: a commitment to hiring the best people; cutting-edge research tools; project management that gets things done faster, better and cheaper; and outstanding research efforts that serve the scientific professions and the nation.

More than any other NASA Center, Ames remains shaped by its origins in the NACA (National Advisory Committee for Aeronautics). Not that its missions remain the same. Sure, Ames still houses the world's greatest collection of wind tunnels and simulation facilities, its aerodynamicists remain among the best in the world, and pilots and engineers still come for advice on how to build better aircraft. But that is increasingly part of Ames' past.

Ames people have embraced two other missions for its future. First, intelligent systems and information science will help NASA use new tools in supercomputing, networking, telepresence and robotics. Second, astrobiology will explore the prospects for life on Earth and beyond. Both new missions leverage Ames' long-standing expertise in computation and in the life sciences, as well as its relations with the computing and biotechnology firms working in the Silicon Valley community that has sprung up around the Center.

Rather than the NACA missions, it is the NACA culture that still permeates Ames. The Ames way of research management privileges the scientists and engineers working in the laboratories. They work in an atmosphere of freedom, laced with the expectation of integrity and responsibility. Ames researchers are free to define their research goals and define how they contribute to the national good. They are expected to keep their fingers on the pulse of their disciplines, to be ambitious yet frugal in organizing their efforts, and to always test their theories in the laboratory or in the field. Ames' leadership ranks, traditionally, are cultivated within this scientific community. Rather than manage and supervise these researchers, Ames leadership merely guides them, represents them to NASA headquarters and the world outside, then steps out of the way before they get run over.

After twenty years as a NACA facility, Ames moved slowly into the NASA way of doing things. The life sciences came to Ames, as did new simulation facilities and heat-transfer tunnels. Yet Smith DeFrance remained as director, as distant from Washington as

ever. Harvey Allen, the embodiment of the Ames spirit of scientific ingenuity, took over as director and stayed until Apollo's end was in sight. Hans Mark arrived in 1969 as a technical leader but also as an outsider. During his seven years at Ames he put an indelible stamp on the Center, retaining its scientific spirit and encouraging the tendencies toward collaboration outside the agency. In doing so, he refocused Ames' vision of itself toward broader national goals in the post-Apollo period. Then Ames stayed largely the same, while NASA gradually changed. Headquarters began to appreciate the Ames way of research management: doing projects that are faster, better, and cheaper; letting researchers freely hone the building blocks of what might someday be much larger projects; seeking collaboration from other research institutions; and reaching out into much broader communities to bring in a diverse group of the best people. Each subsequent Center director refined and expanded that Ames culture into new areas of science and technology.

Simulation, approximation, visualization: these grander abstractions have motivated the intellectual impulses of most everyone who has worked at Ames. Ames people have simulated virtually every facet of air and space travel. Ames people built ingenious instruments to measure and model things that are not easily witnessed by the human eye: airflows, heat transfer, and the chemical compositions of far planets. They created, then overlaid, multiple methods to approximate ever better how planned devices would encounter the real world. The design of the tilt rotor aircraft—as well as of planetary probes, guided missiles, and space capsules—succeeded from constant iteration: wind tunnel tests with ever better Reynolds numbers were matched with computational fluid dynamic models having added dimensions of flows, which were

matched to controlled pilot simulations, then tested in flights approaching operational conditions. Likewise, Ames' understanding of how microgravity affects life grew through complementary terrestrial tests on animals and plants, computer modelling and controlled spaceflight experiment packages.

Ames has won many "firsts" in its scientific endeavors: thermal deicing, the blunt body concept, the supersonic area rule, hypersonic ranges, arc jets, the chemical origins of life, tilt rotor aircraft, computational fluid dynamics, massively parallel computing, air traffic controls, astrobiology, telepresence, airborne science, infrared astronomy, exploration of the outer planets, and the discovery of water on the Moon. Rather than establishing when Ames was first among its research peers, this book instead focuses on how these accomplishments contributed to the greater scientific endeavors and how they affirm and exemplify an enduring research culture. Ames has played a pioneering role in science and technology over six decades, and all those who labored here can take pride in how they have worked together to create the atmosphere of freedom that makes excellence flourish at the NASA Ames Research Center.